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Shin

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(54) **SCANNING APPARATUS AND IMAGE FORMING APPARATUS HAVING THE SAME**

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E05D 7/04 (2006.01)
H04N 1/00 (2006.01)

(57) **ABSTRACT**
A scanning apparatus and an image forming apparatus having the same. The scanning apparatus includes: a main body having a scanning unit; a cover to open and close upon an upper surface of the main body; a hinge unit disposed on one of the main body and the cover so that the cover is rotatable with respect to the main body; a hinge accommodating unit disposed on the other of the main body and the cover to accommodate the hinge unit so that the cover is movable in an upward and downward direction with respect to the upper surface of the main body; and a movement restricting unit disposed on at least one of the hinge unit and the hinge accommodating unit to restrict a movement of the cover in the upward and downward direction.

(52) **U.S. Cl.**
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USPC **399/380**; 399/367; 399/362; 16/242; 16/245

(58) **Field of Classification Search**
USPC 399/380, 362; 16/248, 235, 309, 375, 16/242, 245, 247, 249, 364, 360, 362
See application file for complete search history.

20 Claims, 9 Drawing Sheets

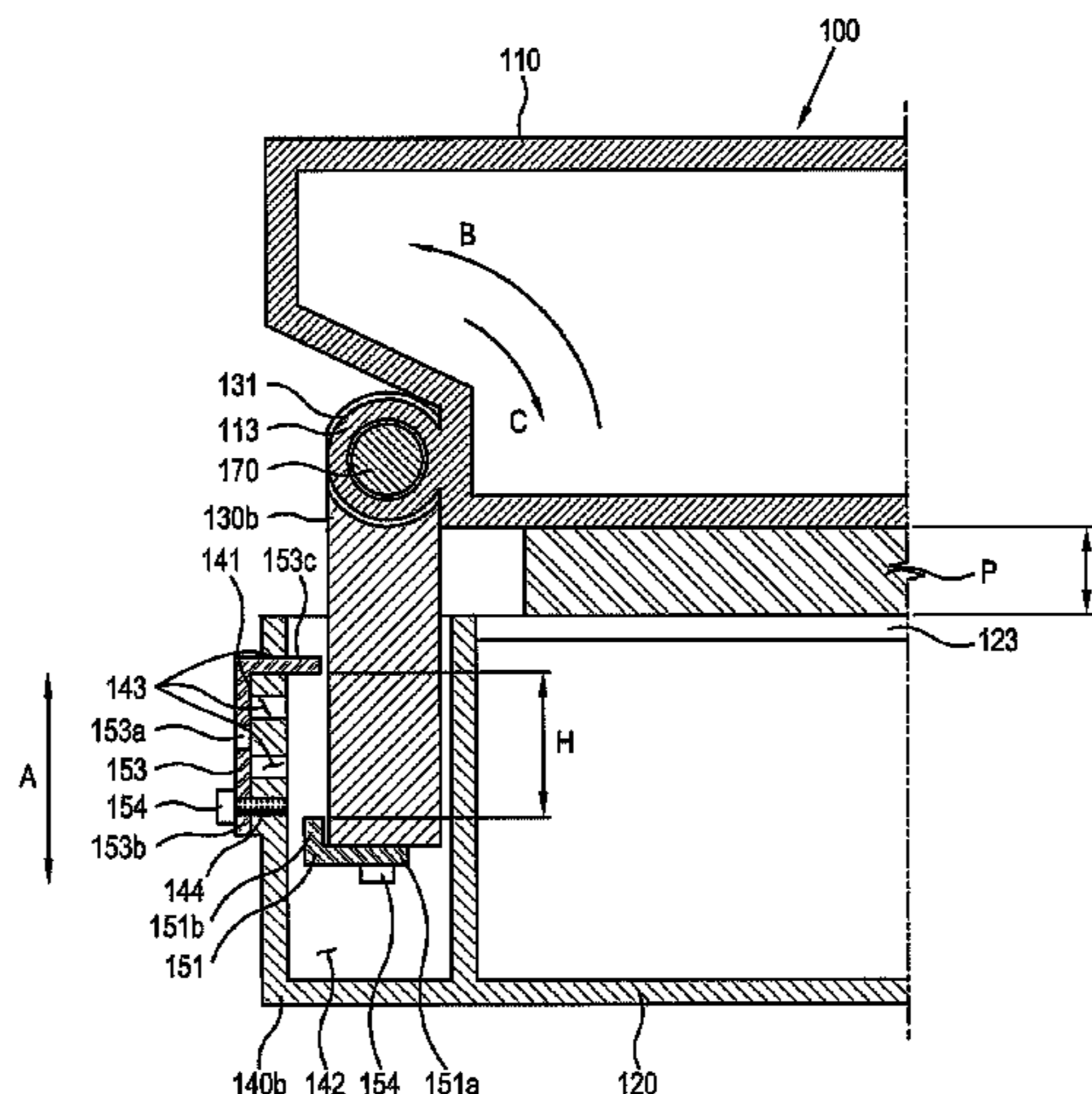


FIG. 1

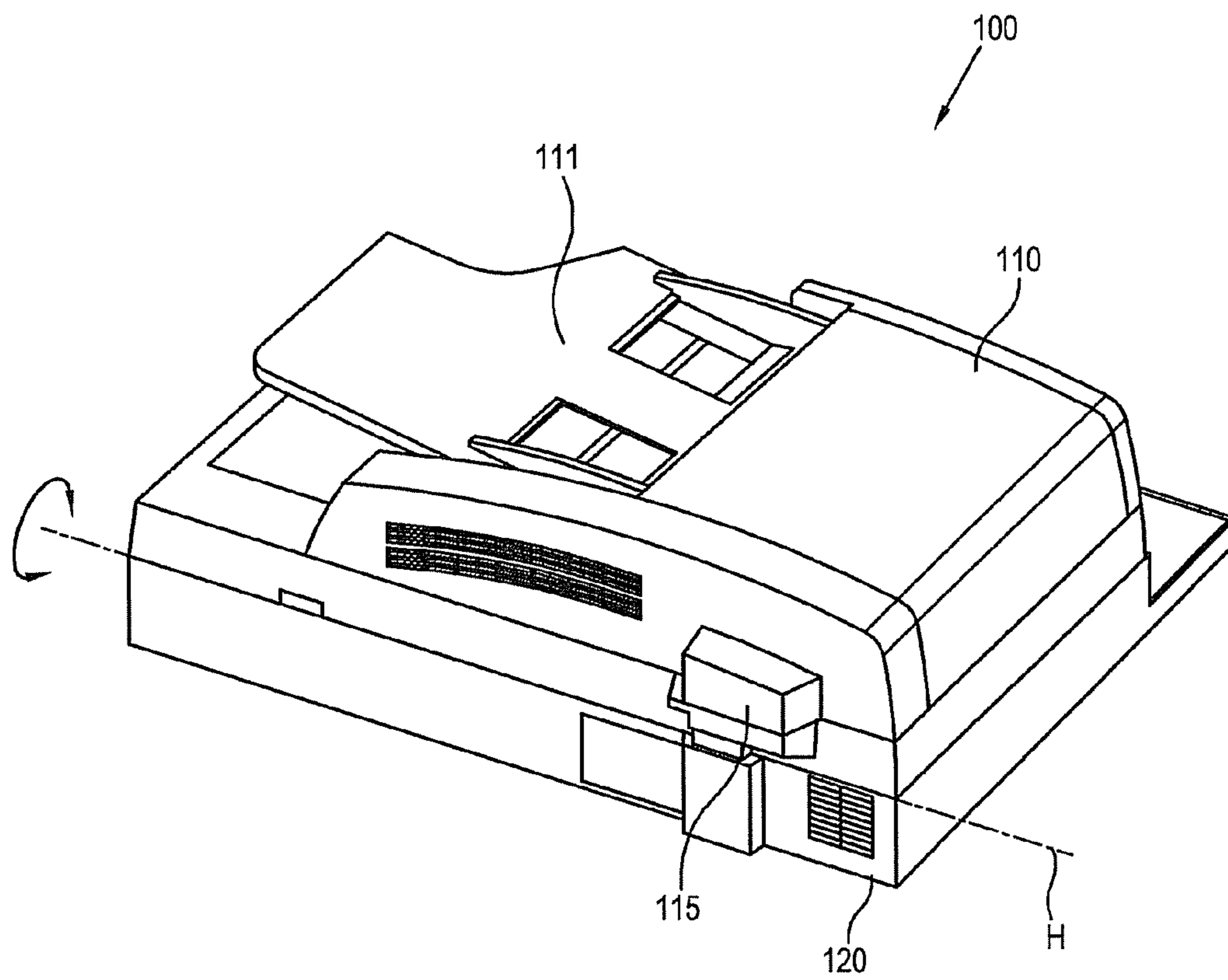


FIG. 2

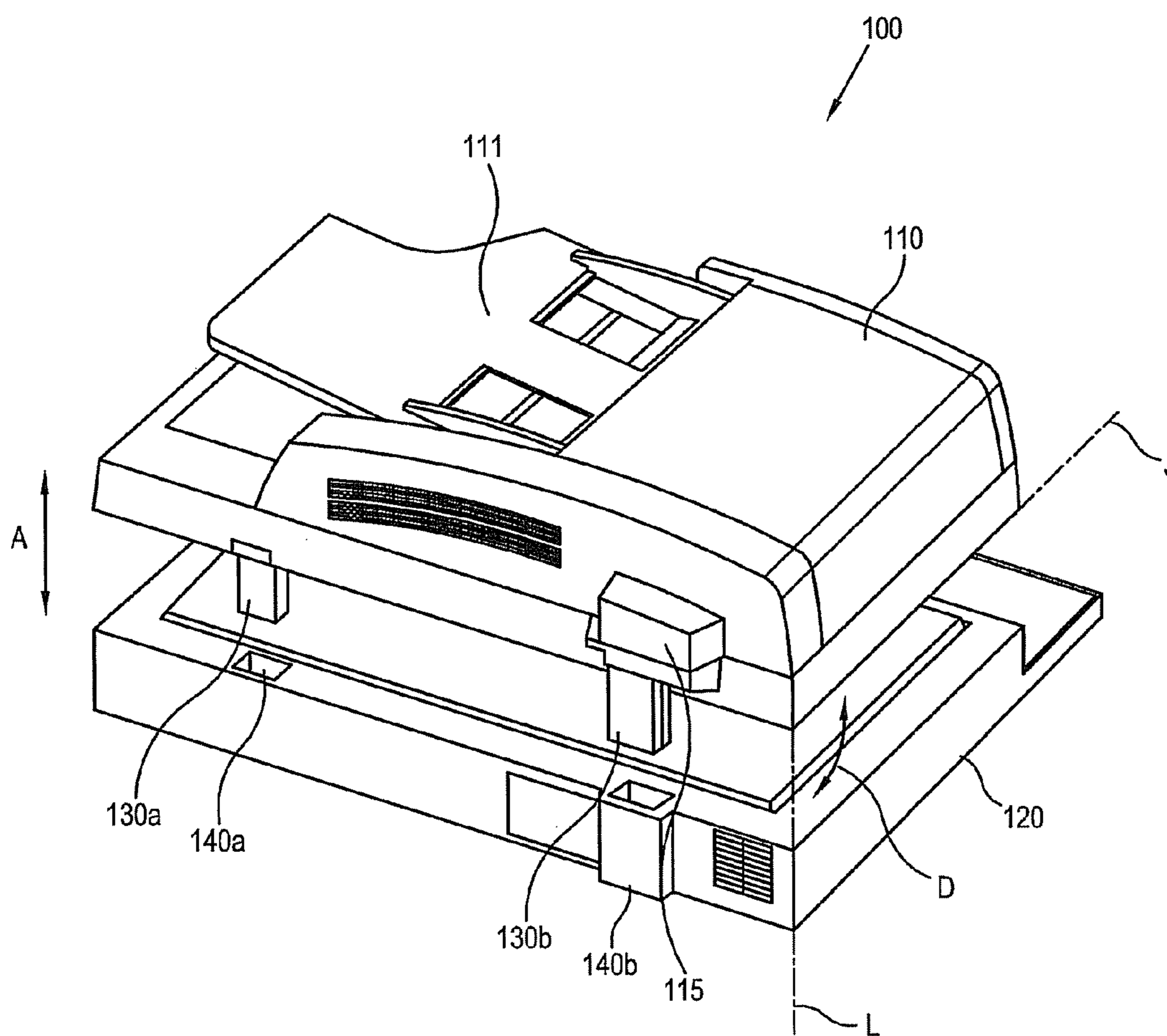


FIG. 3

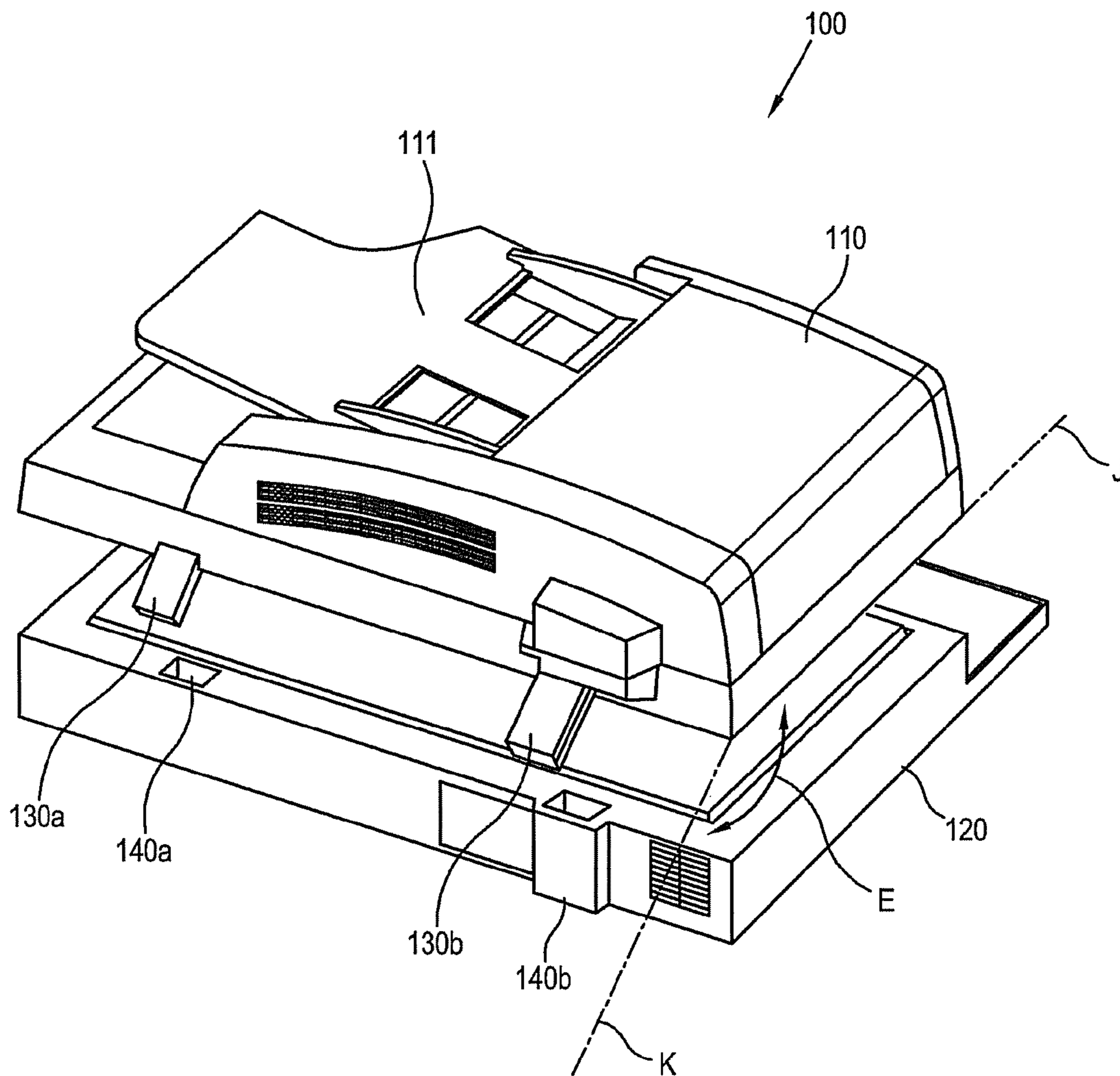


FIG. 4

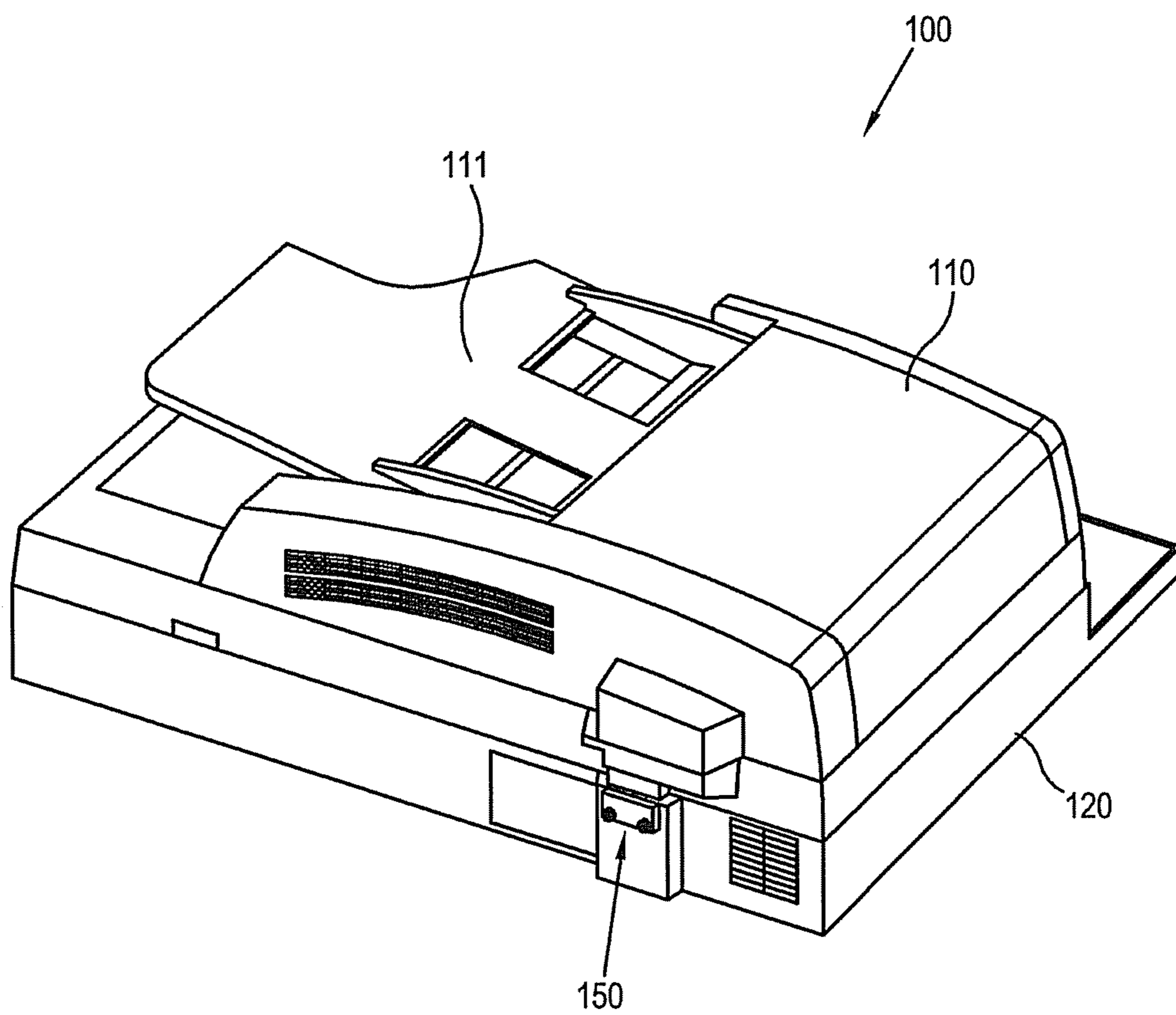


FIG. 5

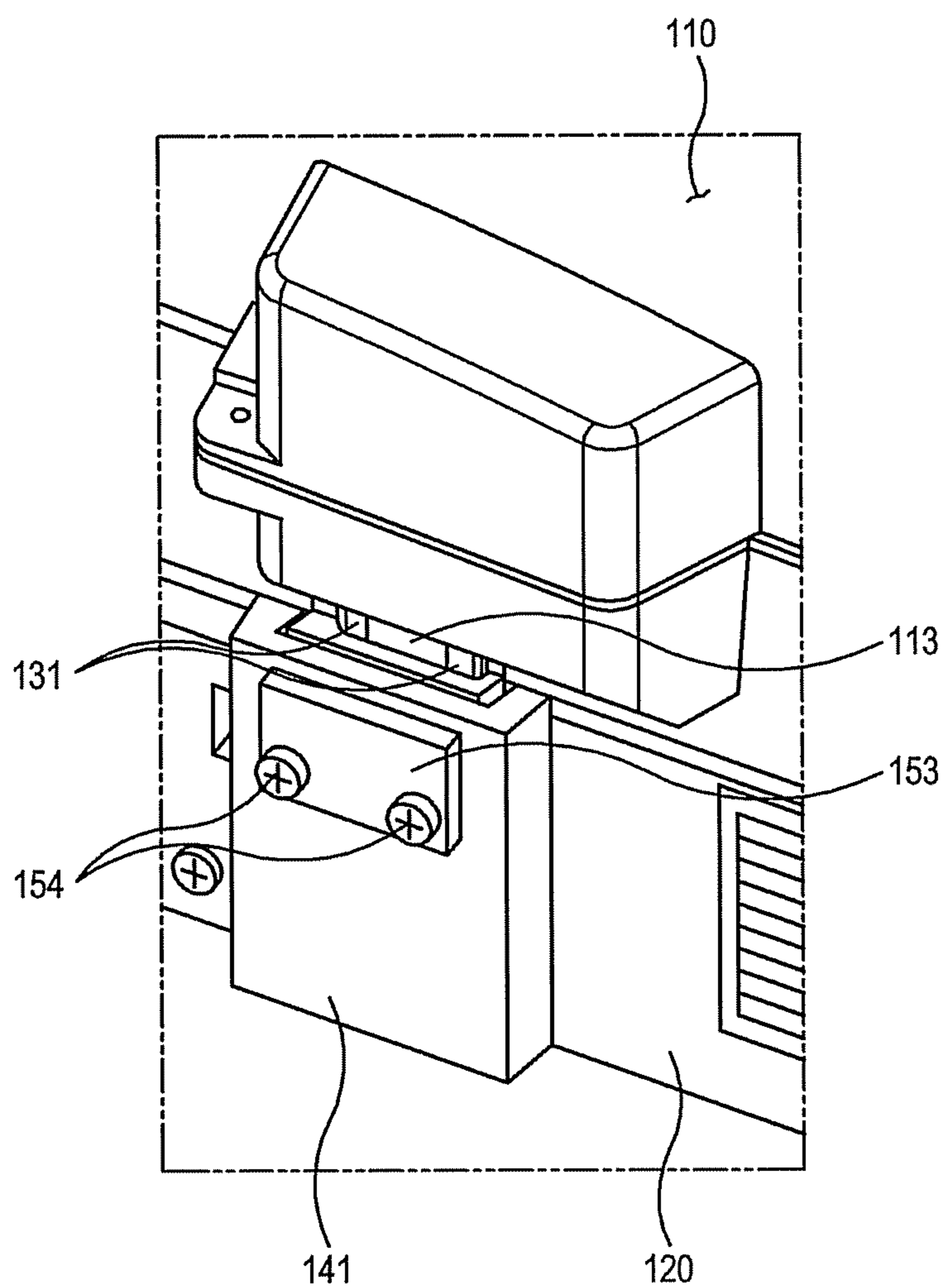


FIG. 6

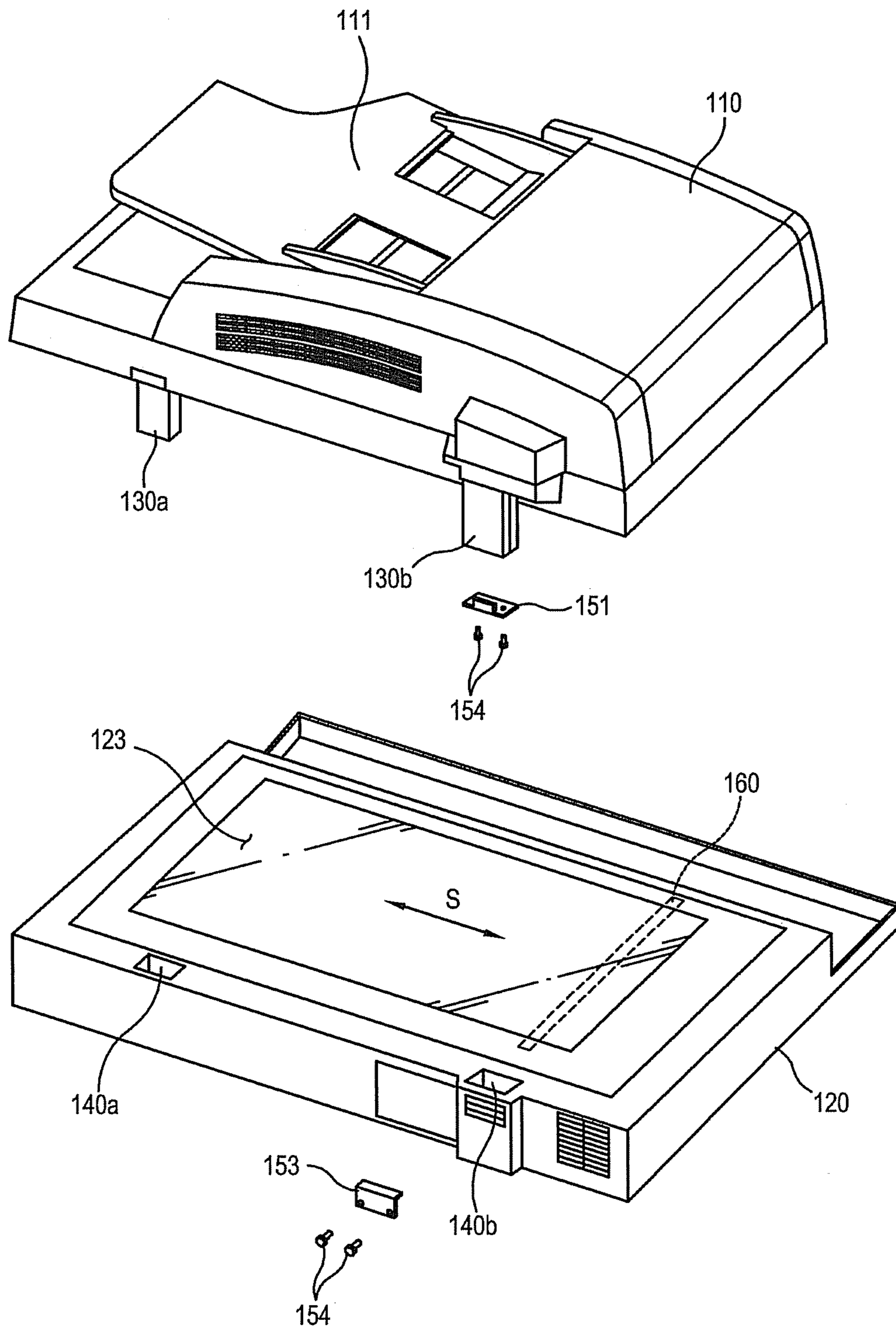


FIG. 7

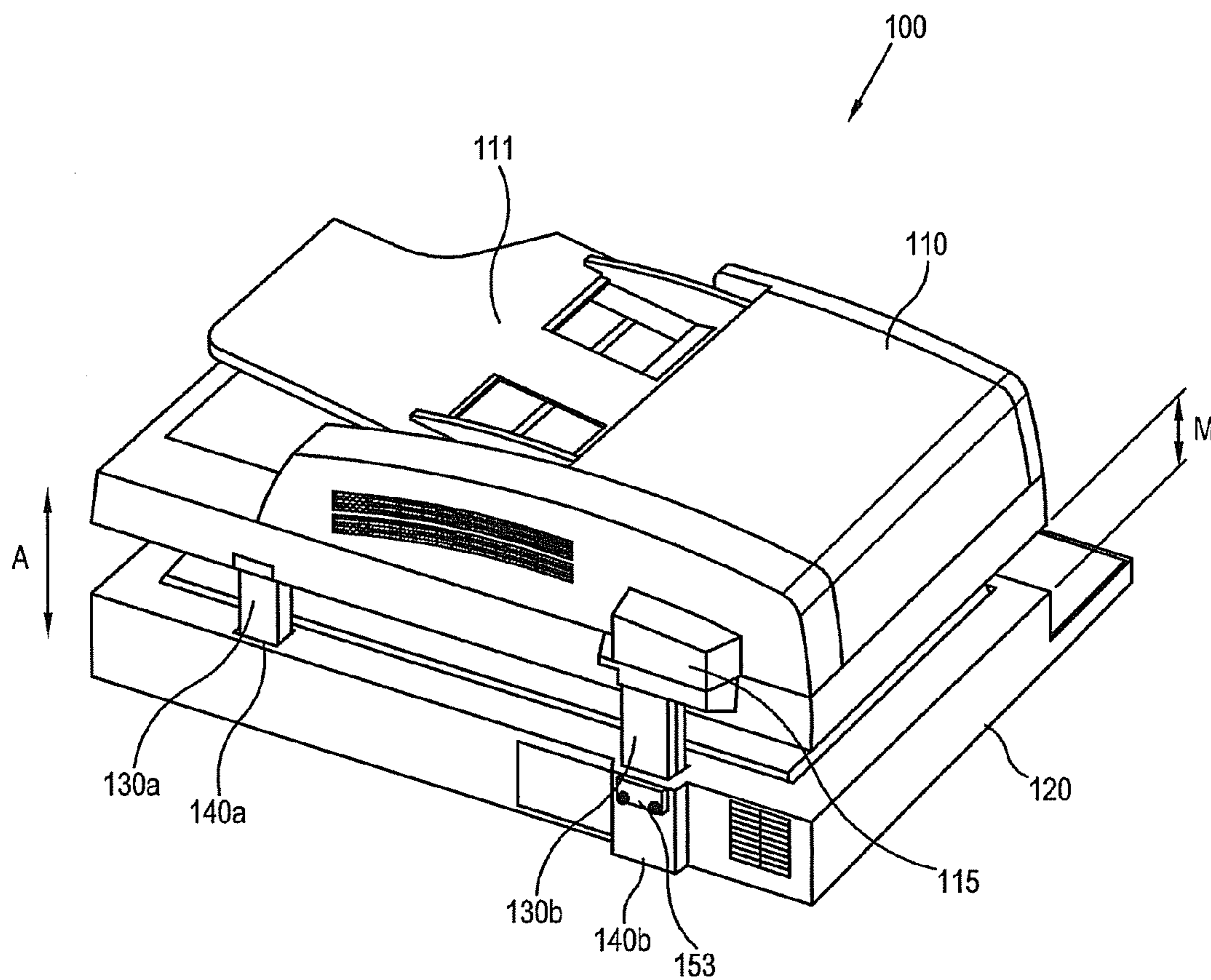


FIG. 8

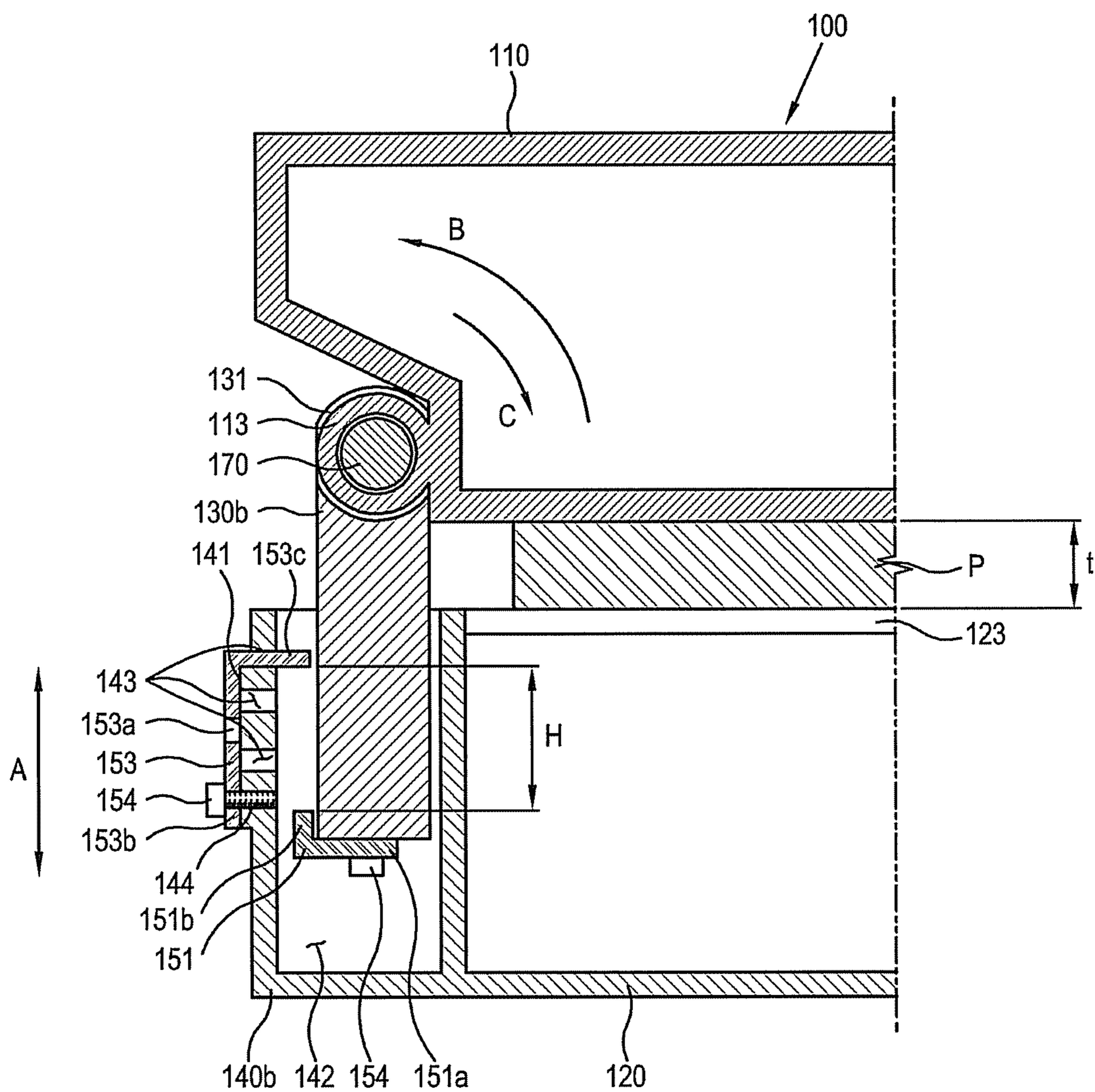
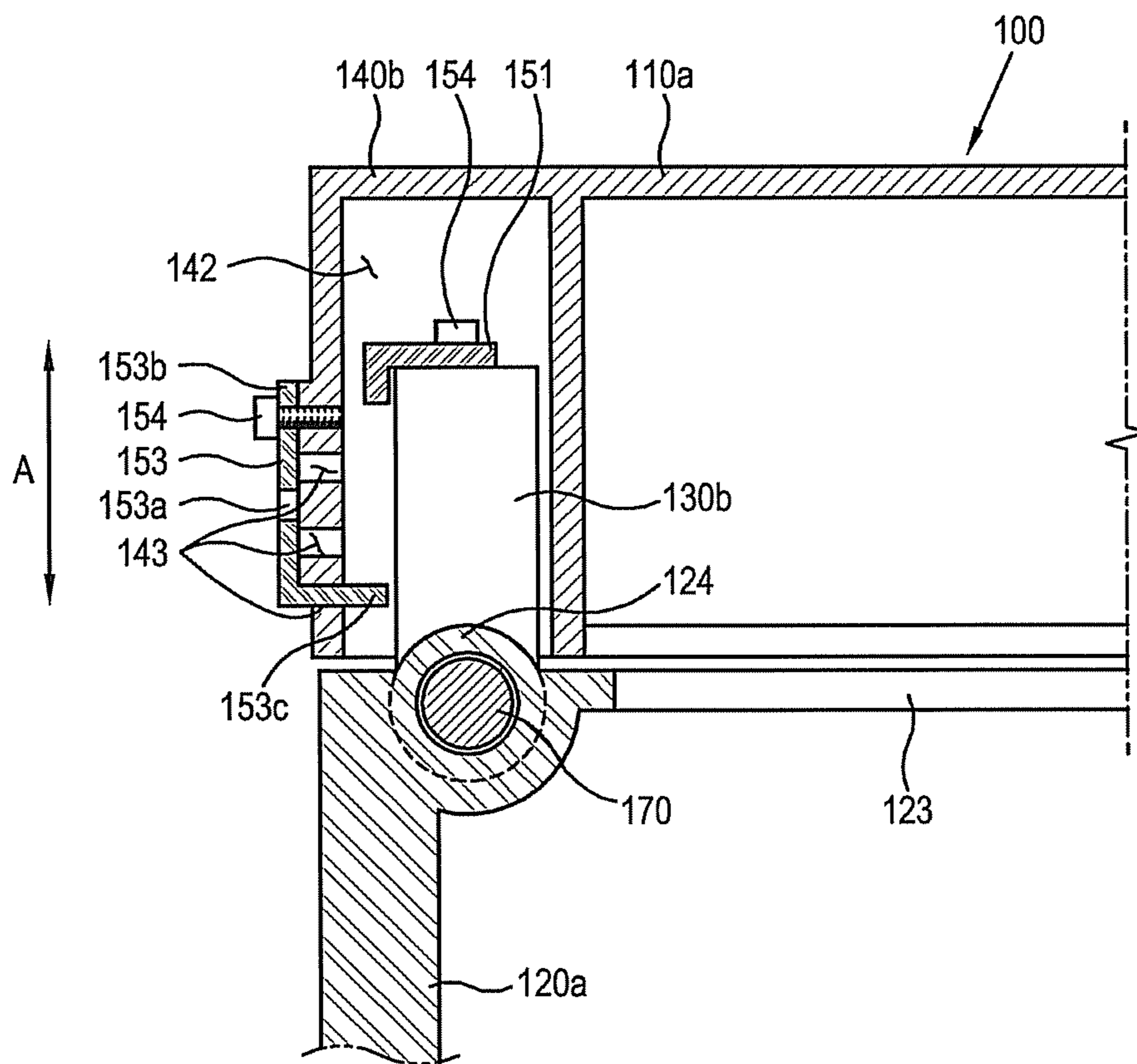


FIG. 9



SCANNING APPARATUS AND IMAGE FORMING APPARATUS HAVING THE SAME

CROSS-REFERENCE TO RELATED APPLICATION

This application claims benefit of Korean Application No. 10-2008-0079145, filed Aug. 12, 2008 in the Korean Intellectual Property Office, the disclosure of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

Aspects of the present invention relate to a scanning apparatus and an image forming apparatus having the same, and more particularly to a scanning apparatus capable of improving maintenance and user safety, and an image forming apparatus having the same.

2. Description of the Related Art

An image forming apparatus forms an image on a printing medium (the printing medium may be paper, a transparency, an adhesive label or sticker, etc.), and the image forming apparatus may be an electronic copier, a printer, a multifunction device, a facsimile, or other such devices. Also, the image forming apparatus, such as the electronic copier, includes a scanning apparatus for scanning an image appearing on a document to be scanned, and includes a scanning apparatus having an automatic document feeder (ADF) for automatically transporting the document to be scanned to a scanning unit of the scanning apparatus.

The automatic document feeder is disposed on an upper side of a main body of the scanning apparatus, and a transparent flat glass is disposed on an upper surface of the main body so that a user can manually dispose a document to be scanned thereon. Also, the automatic document feeder rotates so as to open and close upon the upper surface of the main body.

However, for maintenance of the automatic document feeder, the automatic document feeder should easily detach from the main body.

Also, in scanning a book or a thick document, it is preferable that the automatic document feeder is movable in an up and down direction to some extent so that the automatic document feeder can stably press the book or the thick document.

Also, if a user detaches the automatic document feeder from the main body by mistake, factors which bodily harm or physically injure the user should be prevented.

SUMMARY OF THE INVENTION

Accordingly, it is an aspect of the present invention to provide a scanning apparatus enabling a user to safely use the scanning apparatus, and an image forming apparatus having the same.

Another aspect of the present invention is to provide a scanning apparatus allowing easy maintenance of the scanning apparatus, and an image forming apparatus having the same.

Another aspect of the present invention is to provide a scanning apparatus capable of stably scanning a thick document, and an image forming apparatus having the same.

Aspects of the present invention provide a scanning apparatus, including: a main body having a scanning unit; a cover to open and close upon an upper surface of the main body; a hinge unit disposed on one of the main body and the cover so

that the cover is rotatable with respect to the main body; a hinge accommodating unit disposed on the other of the main body and the cover to accommodate the hinge unit so that the cover is movable in an upward and downward direction with respect to the upper surface of the main body; and a movement restricting unit disposed on at least one of the hinge unit and the hinge accommodating unit to restrict a movement of the cover in the upward and downward direction.

The cover may include an automatic document feeder which transports a document to be scanned to the scanning unit.

The movement restricting unit may include: an engagement unit disposed on one of the hinge unit and the hinge accommodating unit, and an engagement projection disposed on a position of the other of the hinge unit and the hinge accommodating unit at a predetermined interval distance in the upward and downward direction with respect to the engagement unit contacting the engagement unit if the cover moves upwardly with respect to the upper surface of the main body.

The engagement unit and the engagement projection may be detachably coupled to the hinge unit and the hinge accommodating unit.

The engagement projection may include an accommodating unit coupling piece coupled to the hinge accommodating unit, and an internal protruding piece protruding towards an inner part of the hinge accommodating unit, and the engagement unit may include a hinge unit coupling piece coupled to a lower part of the hinge unit, and an external protruding piece protruding to an outer part of the hinge unit to contact the internal protruding piece in an inner part of the hinge accommodating unit.

The scanning apparatus may further include a coupler detachably coupling the accommodating unit coupling piece and the hinge accommodating unit.

The hinge accommodating unit may further include a plurality of thru-holes formed in the upward and downward direction to allow the internal protruding piece to pass through to adjust the predetermined interval distance between the engagement projection and the engagement unit.

The hinge accommodating unit may include a hinge unit accommodating space formed in an upward and downward direction to accommodate the hinge unit, and the hinge unit extends in the upward and downward direction to slide in the hinge unit accommodating space.

The scanning apparatus may further include an elastic member elastically biasing the cover so that the cover is rotatable in a direction of opening the upper surface of the main body.

Aspects of the present invention provides an image forming apparatus, including: the above scanning apparatus; and an image forming unit to form on a printing medium an image corresponding to image data of a document to be scanned by the scanning unit.

The movement restricting unit comprises an engagement unit disposed on one of the hinge unit and the hinge accommodating unit, and an engagement projection disposed on a position of the other of the hinge unit and the hinge accommodating unit at a predetermined distance interval in the upward and downward direction with respect to the engagement unit and contacting the engagement unit if the cover moves upwardly with respect to the upper surface of the main body.

The engagement unit and the engagement projection may be detachably coupled to the hinge unit and the hinge accommodating unit.

The engagement projection may include an accommodating unit coupling piece coupling the hinge accommodating unit, and an internal protruding piece protruding towards an inner part of the hinge accommodating unit, and the engagement unit may include a hinge unit coupling piece coupled to a lower part of the hinge unit, and an external protruding piece protruding to an outer part of the hinge unit to contact the internal protruding piece in an inner part of the hinge accommodating unit.

The image forming apparatus may further include a coupler detachably coupling the accommodating unit coupling piece and the hinge accommodating unit.

The hinge accommodating unit may further include a plurality of thru-holes formed in the upward and downward direction, and allowing the internal protruding piece to pass through to adjust the predetermined interval between the engagement projection and the engagement unit.

The hinge accommodating unit may include a hinge unit accommodating space formed in an upward and downward direction to accommodate the hinge unit, and the hinge unit extends in the upward and downward direction to slide in the hinge unit accommodating space.

The cover may rotate in a direction closing the upper surface of the main body by its own weight, and the image forming apparatus may further include an elastic member elastically biasing the cover so that the cover is rotatable in a direction of opening the upper surface of the main body.

Additional aspects and/or advantages of the invention will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

These and/or other aspects and advantages of the invention will become apparent and more readily appreciated from the following description of the embodiments, taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a schematic perspective view of a scanning apparatus according to a first embodiment of the present invention;

FIG. 2 is a schematic perspective view illustrating a cover of the scanning apparatus in FIG. 1 moved upwardly;

FIG. 3 is a schematic perspective view illustrating a hinge unit disposed to the cover in FIG. 2 elastically restored by an elastic member;

FIG. 4 is a schematic perspective view of the scanning apparatus in FIG. 1 provided with a movement restricting unit;

FIG. 5 is an enlarged perspective view illustrating a main portion of FIG. 4;

FIG. 6 is an exploded perspective view of the scanning apparatus in FIG. 5;

FIG. 7 is a schematic perspective view illustrating the cover of the scanning apparatus in FIG. 4 moved upwardly;

FIG. 8 is an enlarged sectional main portion view illustrating a document inserted to the scanning apparatus in FIG. 4; and

FIG. 9 is an enlarged sectional main portion view of a scanning apparatus according to a second embodiment of the present invention.

DETAILED DESCRIPTION OF THE EMBODIMENTS

Reference will now be made in detail to the present embodiments of the present invention, examples of which are illustrated in the accompanying drawings, wherein like ref-

erence numerals refer to like elements throughout. The embodiments are described below in order to explain the present invention by referring to the figures.

According to a first embodiment of the present invention, as shown in FIG. 1, a scanning apparatus 100 includes a cover 110 and a main body 120.

The main body 120 includes a scanning unit 160, as shown in FIG. 6, scanning a document to generate an image data corresponding to an image of the scanned document.

The cover 110 is disposed on an upper surface of the main body 120, and rotates about a hinge pivot line H to open and close upon the upper surface of the main body 120.

The cover 110 may include an automatic document feeder (ADF) 110a transporting a document to be scanned that is put on a document table 111 toward the scanning unit 160 in FIG. 6.

As shown in FIG. 6, the upper surface of the main body 120 includes a platen 123 formed of transparent glass. The document to be scanned may be put on the document table 111, and automatically transported to be scanned, or the document to be scanned may be put on the platen 123 manually to be scanned. The scanning unit 160 is disposed on a lower part of the platen 123, and the scanning unit 160 scans an image of the document to be scanned that is put on the platen 123 while moving along a scanning direction S. The automatic document feeder 110a transports the document to be scanned that is put on the document table 111 to the platen 123, the transported document is scanned, and the scanned document is discharged after completing the scanning. The transporting, scanning and discharging processes are repeated for the next sheet of the scanned document, thereby performing an automatic scanning for a plurality of sheets of documents.

As shown in FIG. 2, an image forming apparatus 100 includes a plurality of hinge units 130a and 130b enabling the automatic document feeder 110a to rotate about the hinge pivot line H, as shown in FIG. 1, so that the automatic document feeder 110a can open and close upon the upper surface of the main body 120, and a plurality of hinge accommodating units 140a and 140b respectively accommodating the plurality of hinge units 130a and 130b. Two hinge units 130a and 130b and two hinge accommodating units 140a and 140b are illustrated in the present embodiment, however, aspects of the present invention are not limited thereto.

The hinge units 130a and 130b are coupled to the automatic document feeder 110a to rotate about the hinge pivot 170 in FIG. 8.

The automatic document feeder 110a and the hinge units 130a and 130b are respectively provided with hinge pivot insertion units 113 and 131, as shown in FIGS. 5 and 8, to which the hinge pivot 170 in FIG. 8 is inserted.

Also, for convenience of repair, as shown in FIG. 2, the hinge units 130a and 130b may be separated from the hinge accommodating units 140a and 140b if the cover 110 is lifted up from the main body 120 in an upward direction A.

Also, since the weight of the automatic document feeder 110a is considerable, the automatic document feeder 110a is not easily lifted when a user rotates and opens the automatic document feeder 110a.

Accordingly, an elastic member (not shown) elastically biasing the automatic document feeder 110a so that the automatic document feeder 110a is rotatable in a direction of opening the upper surface of the main body 120 may be further provided so that a user can further easily rotate and open the automatic document feeder 110a. The elastic member is disposed on the hinge pivot 170 in FIG. 8, and as shown in FIG. 3, elastically biases the hinge units 130a and 130b so that an angle E between an extending line K of the hinge units

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130a and **130b** and a lower surface of the automatic document feeder **110a** can have an obtuse angle in a balance state.

As shown in FIG. 2, if the hinge units **130a** and **130b** are accommodated on the hinge accommodating units **140a** and **140b**, because the hinge units **130a** and **130b** are prevented from rotating due to interference with the hinge accommodating units **140a** and **140b**, an angle D between an extending direction L of the hinge units **130a** and **130b** and the lower surface of the automatic document feeder **110a** becomes smaller than that of the balance state described above. Accordingly, an elastic force of the elastic member is applied to the cover **110**. In other words, the elastic force of the elastic member is applied in direction B, as shown in FIG. 8, to rotate and open the automatic document feeder **110a**.

The automatic document feeder **110a** rotates in direction C, as shown in FIG. 8, to close upon the upper surface of the main body **120** due to the weight of the automatic document feeder **110a**.

Although the automatic document feeder **110a** close upon the upper surface of the main body **120** due to its own weight, since the elastic force by the elastic member is added thereto as a user lifts up the automatic document feeder **110a**, the user is capable of lifting up the automatic document feeder **110a** by applying less force.

As shown in FIG. 2, the hinge units **130a** and **130b** may extend in an upward and downward direction A so that the automatic document feeder **110a** can elevate in the upward and downward direction A. The hinge units **130a** and **130b** can elevate in the upward and downward direction A and can be inserted in the hinge accommodating units **140a** and **140b** so that the automatic document feeder **110a** can elevate in the upward and downward direction A at a side to which the hinge units **130a** and **130b** are disposed, and concurrently, is rotatable about the hinge pivot line H.

Accordingly, if a thick document P, as shown in FIG. 8, is put on the platen **123**, since the automatic document feeder **110a** is capable of pressing the document P by being moved in the upward direction A by the thickness of the document P, a surface of the document P is flatly disposed on a surface of the platen **123**. Accordingly, quality of a scanning data acquired according to scanning a thick document can be improved.

For example, when a part of a book is to be copied and the book is opened and put on the platen **123**, the exposed pages of the book may closely contact the platen **123**. However, a central part of the book to be copied may be substantially distanced from the platen **123**, and accordingly, the focal distance from the scanning unit **160** to an image surface of the document to be scanned varies so that a scanning data corresponding to the central part of the book may be darker than that of a scanning data corresponding to the outer part of the book, and clarity of the scanning data corresponding to the outer part of the book deteriorates. Accordingly, since the automatic document feeder **110a** moves in the upward direction A at the central part of the book disposed on the platen **123** to press the central part of the book, the book can closely contact the platen **123**, thereby improving the quality of a scanned image.

The hinge accommodating units **140a** and **140b** may be provided in shapes corresponding to the hinge units **130a** and **130b**. As the hinge units **130a** and **130b** extend in the upward and downward direction A, the hinge accommodating units **140a** and **140b** may include a hinge unit accommodating space **142** in FIG. 8 extending in the upward and downward direction A to correspond thereto.

The automatic document feeder **110a** further includes a roller (not shown) for transporting a document to be scanned

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that is put on the document table **111** to the scanning unit **160**, and a driving motor (not shown) for rotating the roller. The driving motor may be disposed inside a driving motor accommodating unit **115**.

The driving motor accommodating unit **115** may be provided to outwardly protrude from the automatic document feeder **110a** in correspondence to the size of the driving motor.

Here, if a user mistakes the protruding driving motor accommodating unit **115** for a handle, and lifts the automatic document feeder **110a** in the upward direction A, the hinge unit **130b** is extended in a direction corresponding to the lifting as the hinge unit **130b** is separated from the hinge accommodating unit **140b** while an elastic member applies an elastic force. Accordingly, as the hinge unit **130** extends, a hand of the user holding the driving motor accommodating unit **115** may be caught between the hinge unit **130b** and the main body or between other units of the image forming apparatus and may be injured.

To prevent this, the scanning apparatus **100** may further include a movement restricting unit **150** disposed on either the hinge unit **130b** or the hinge accommodating unit **140b** to restrict a movement in the upward and downward direction A of the cover **110** or the automatic document feeder **110a**.

As shown in FIGS. 4 to 8, the movement restricting unit **150** includes an engagement unit **151** and an engagement projection **153**.

The engagement unit **151** is disposed on either the hinge units **130a** and **130b** or the hinge accommodating units **140a** and **140b**, and the engagement projection **153** is disposed on either the hinge units **130a** and **130b** or the hinge accommodating units **140a** and **140b** of which the engagement unit **151** is not disposed on, and is disposed to a position distanced from the engagement unit **151** by a predetermined interval H in the upward direction A. Accordingly, if the engagement unit **151** and the engagement projection **153** contact each other and interfere with each other, the hinge units **130a** and **130b** are prevented from being completely separated from the hinge accommodating units **140a** and **140b**, thereby restricting an upward movement thereof. Here, as shown in FIG. 8, since the predetermined interval H is an interval between the engagement unit **151** and the engagement projection **153** under the state that the document P is interposed between the automatic document feeder **110a** and the platen **123**, as shown in FIG. 7, a maximum distance interval M between the engagement unit **151** and the engagement projection **153** in the upward direction A becomes a value $H+t$ which is the predetermined interval H added with the thickness t of the document P. That is, the cover **110** and the automatic document feeder **110a** can move the maximum distance interval M in the upward direction A from the upper surface of the main body **120**.

As shown in FIG. 7, although a user holds the driving motor accommodating unit **115** and lifts up the automatic document feeder **110a**, the engagement unit **151** and the engagement projection **153** interfere with each other so that the hinge units **130a** and **130b** can be prevented from being separated from the hinge accommodating units **140a** and **140b**. Accordingly, an injury to the user can be prevented.

Also, the engagement projection **153** includes an accommodating unit coupling piece **153b** coupled to an outer surface **141** of the hinge accommodating unit **140b**, as shown in FIG. 8, and an internal protruding piece **153c** protruding toward an inner part of the hinge accommodating unit **140b**. Here, the accommodating unit coupling piece **153b** and the hinge accommodating unit **140b** are coupled by a coupler **154** such as a bolt which is capable of being detachably coupled.

Accordingly, if a user lifts up the driving motor accommodating unit **115** by mistake, the engagement unit **130b** can be prevented from being separated from the hinge accommodating unit **140b** by the interference between the engagement projection **153** and the engagement unit **151**, thereby preventing an accident to the user.

Also, if it is necessary to detach the automatic document feeder **110a** from the main body **120** for maintenance or repair, it is sufficient to disassemble the coupler **154** in order to detach the engagement projection **153** from the hinge accommodating unit **140b**, thereby easily maintaining or repairing the scanning apparatus **100**.

The hinge accommodating unit **140b** includes a tap hole **144** formed with a female screw thread engaged with a male screw thread of the coupler **154**.

The engagement unit **151** includes a hinge unit coupling piece **151a** coupled to a lower part of the hinge unit **130b**, and an external protruding piece **151b** protruding to an outer part of the hinge unit **130b** to contact with the internal protruding piece **153c** in an inner part of the hinge accommodating unit **140b**.

Also, as shown in FIG. **8**, the hinge accommodating unit **140b** includes a plurality of thru-holes **143** formed in the upward and downward direction **A** to adjust the predetermined internal distance **H** between the engagement unit **151** and the engagement projection **153**.

The internal protruding piece **153c** of the engagement projection **153** is disposed to pass through one of the plurality of thru holes **143** so that the predetermined interval **H** can be adjusted. For example, as shown in FIG. **8**, the internal protruding piece **153c** is illustrated to pass through a thru hole **143** of the most top position. Alternatively, the internal protruding piece **153c** may be disposed to pass through a thru hole **143** of a central position as necessary. Here, if the engagement projection **153** is disposed to the thru hole **143** of the central position, a coupling hole **153a** formed to the engagement projection **153** may be provided to accord to the tab hole **144**. Accordingly, the engagement projection **153**, the interval of which is adjusted can be coupled to the hinge accommodating unit **140b** again with the same coupler **154**.

As described above, the movement restricting unit **150** is illustrated, as seen in FIG. **5**, to be disposed on only the hinge unit **130b** and the hinge accommodating unit **140b** of the right side among the hinge units **130a** and **130b** and the hinge accommodating units **140a** and **140b** of the opposite sides. Alternatively, the movement restricting unit **150** may be disposed on only the hinge unit **130a** and the hinge accommodating unit **140a** of the left side as necessary. Also, the movement restricting unit **150** may be disposed on all of the hinge units **130a** and **130b** and the hinge accommodating units **140a** and **140b** of the opposite sides as necessary.

According to a secondary embodiment of the present invention, as shown in FIG. **9**, a scanning apparatus **100** may include a hinge unit **130b** disposed on a main body **120a**, and a hinge accommodating unit **140b** may be disposed on a cover **110a** or on an automatic document feeder **110a**.

The main body **120a** includes a hinge pivot insertion unit **124** to which a hinge pivot **170** is inserted.

The positions to which the hinge unit **130b** and the hinge accommodating unit **140b** are disposed are opposite to those of the first embodiment, and detailed descriptions of the some elements will be omitted because they have the same configurations as the first embodiment.

An image forming apparatus (not shown) according to another embodiment of the present invention may further include the scanning apparatuses **100** or **100a** described above, and an image forming unit (not shown) printing an

image corresponding to an image of a document scanned by the scanning apparatuses **100** or **100a** on a printing medium.

Here, the image forming apparatus may form an image by at least one of an inkjet type forming process forming an image on a printing medium with an ink, an electro-photographic type forming process forming an image on a printing medium with a toner, and a thermo-electronic type forming process forming an image on a heat sensitive printing medium by using a thermal printing head (TPH).

The inkjet type forming process has a printing head having a plurality of nozzles. The electro-photographic type forming process has an image carrying body (not shown) having an organic photo sensitive layer on an outer surface thereof, a light exposing unit (not shown) exposing a surface of the image carrying body to form an electrostatic latent image, a developing cartridge (not shown) developing the electrostatic latent image with a toner, a transferring unit (not shown) transferring the toner to a printing medium, and a fusing unit (not shown) fusing the toner transferred to the printing medium with heat and pressure.

As described above, a scanning apparatus and an image forming apparatus having the same according to aspects of the present invention have the following and or other effects.

First, safety of a user can be ensured in spite of mistake of the user.

Second, a scanning apparatus and an image forming apparatus can be easily repaired and maintained.

Third, scanning a thick document can be stably performed.

Although a few embodiments of the present invention have been shown and described, it will be appreciated by those skilled in the art that changes may be made in this embodiment without departing from the principles and spirit of the invention, the scope of which is defined in the claims and their equivalents.

What is claimed is:

1. A scanning apparatus, comprising: a main body having a scanning unit; a cover to open and close upon an upper surface of the main body;

a hinge unit disposed on one of the main body and the cover so that the cover is rotatable with respect to the main body;

a hinge accommodating unit disposed on the other of the main body and the cover to accommodate the hinge unit so that the cover is movable in an upward and downward direction with respect to the upper surface of the main body; and

an movement restricting unit to restrict a movement of the cover in the upward and downward direction, wherein the movement restricting unit comprises:

an engagement unit disposed on one of the hinge unit and the hinge accommodating unit, and

an internal protruding piece of an engagement projection disposed on the other of the hinge unit and the hinge accommodating unit to contact the engagement unit when the cover moves upwardly with respect to the upper surface of the main body, the internal protruding piece which selectively passes through one of a plurality of thru-holes formed in the upward and downward direction in the other of hinge unit and the hinge accommodating unit, which adjusts with respect to the other of the hinge unit and the hinge accommodating unit, and which allows the cover to travel along a distance in the upward and downward direction that includes having the cover contact the upper surface of the main body,

wherein if the internal protruding piece of the engagement projection passes through any one of the plurality of thru-holes, then a distance of travel for the cover is

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limited over a range of travel in the upward and downward direction which includes the cover contacting the upper surface of the main body.

2. The scanning apparatus according to claim 1, wherein the cover comprises an automatic document feeder which transports a document to be scanned to the scanning unit.

3. The scanning apparatus according to claim 1, wherein the engagement projection is disposed on a position of the other of the hinge unit and the hinge accommodating unit at a predetermined interval distance in the upward and downward direction with respect to the engagement unit, and contacts the engagement unit if the cover moves upwardly with respect to the upper surface of the main body.

4. The scanning apparatus according to claim 3, wherein the engagement unit and the engagement projection are detachably coupled to the hinge unit and the hinge accommodating unit.

5. The scanning apparatus according to claim 3, wherein the engagement projection comprises an accommodating unit coupling piece coupled to the hinge accommodating unit, and the internal protruding piece which protrudes towards an inner part of the hinge accommodating unit, and

wherein the engagement unit comprises a hinge unit coupling piece coupled to a lower part of the hinge unit, and an external protruding piece protruding to an outer part of the hinge unit to contact the internal protruding piece in an inner part of the hinge accommodating unit.

6. The scanning apparatus according to claim 5, further comprising a coupler detachably coupling the accommodating unit coupling piece and the hinge accommodating unit.

7. The scanning apparatus according to claim 5, wherein the hinge accommodating unit further comprises the plurality of thru-holes formed in the upward and downward direction to allow the internal protruding piece to pass through to adjust the predetermined interval distance between the engagement projection and the engagement unit.

8. The scanning apparatus according to claim 1, wherein the hinge accommodating unit comprises a hinge unit accommodating space formed in an upward and downward direction to accommodate the hinge unit, and wherein the hinge unit extends in the upward and downward direction to slide in the hinge unit accommodating space.

9. The scanning apparatus according to claim 1, further comprising an elastic member elastically biasing the cover so that the cover is rotatable to expose the upper surface of the main body.

10. An image forming apparatus, comprising:
the scanning apparatus according to claim 1; and
an image forming unit to form on a printing medium an image corresponding to image data of a document scanned by the scanning unit.

11. The image forming apparatus according to claim 10, wherein the engagement projection is disposed on the other of the hinge unit and the hinge accommodating unit at a predetermined distance interval in the upward and downward direction with respect to the engagement unit.

12. The image forming apparatus according to claim 11, wherein the engagement unit and the engagement projection are detachably coupled to the hinge unit and the hinge accommodating unit.

13. The image forming apparatus according to claim 11, wherein the engagement projection comprises an accommodating unit coupling piece coupling the hinge accom-

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modating unit, and the internal protruding piece which protrudes towards an inner part of the hinge accommodating unit, and

wherein the engagement unit comprises a hinge unit coupling piece coupled to a lower part of the hinge unit, and an external protruding piece protruding to an outer part of the hinge unit to contact the internal protruding piece in an inner part of the hinge accommodating unit.

14. The image forming apparatus according to claim 13, further comprising a coupler detachably coupling the accommodating unit coupling piece and the hinge accommodating unit.

15. The image forming apparatus according to claim 13, wherein the hinge accommodating unit further comprises the plurality of thru-holes formed in the upward and downward direction, allowing the internal protruding piece to pass through to adjust the predetermined interval between the engagement projection and the engagement unit.

16. The image forming apparatus according to claim 10, wherein the hinge accommodating unit comprises a hinge unit accommodating space formed in an upward and downward direction to accommodate the hinge unit, and wherein the hinge unit extends in the upward and downward direction to slide in the hinge unit accommodating space.

17. The image forming apparatus according to claim 10, wherein the cover rotates in a direction of closing the upper surface of the main body by a self weight, and wherein the image forming apparatus further comprises an elastic member elastically biasing the cover so that the cover is rotatable in a direction of opening the upper surface of the main body.

18. The scanning apparatus according to claim 1, wherein if the internal protruding piece of the engagement projection passes through one of the plurality of thru-holes, the distance of travel in the upward and downward direction is less than a maximum distance interval and the cover contacts the upper surface of the main body.

19. A method of coupling a cover of an image forming apparatus to a main body of the image forming apparatus, the method comprising:

coupling the cover of the image forming apparatus to the main body of the image forming apparatus with a hinge unit accommodated by a hinge accommodating unit to allow movement of the cover in directions perpendicular to a plane of a platen of the image forming apparatus; applying a movement restricting force to at least one of the hinge unit and the hinge accommodating unit to restrict a movement of the cover in the directions perpendicular to the plane of the platen of the image forming apparatus; and

contacting an engagement unit disposed on one of the hinge unit and the hinge accommodating unit with an projection, which includes an internal protruding piece, disposed on the other of the hinge unit and the hinge accommodating unit to restrict the movement of the cover in the directions perpendicular to the plane of the platen of the image forming apparatus, the internal protruding piece which selectively passes through one of a plurality of thru-holes formed in the upward and downward direction in the other of the hinge unit and the hinge accommodating unit, which adjusts with respect to the other of the hinge unit and the hinge accommodating unit, and which allows the cover to travel along a distance in the upward and downward direction that include having the cover contact the upper surface of the main body,

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wherein if the internal protruding piece of the engagement projection passes through any one of the plurality of thru-holes, then a distance of travel for the cover is limited over a range of travel in the upward and downward direction which includes the cover contacting the upper surface of the main body. 5

20. The method according to claim **19**, wherein the contacting the engagement unit comprises:

contacting the engagement unit with the internal protruding piece of the engagement projection at a predetermined distance interval in the upward and downward direction to restrict the movement of the cover in the directions perpendicular to the plane of the platen of the image forming apparatus. 10

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UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

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INVENTOR(S) : Dae-Lim Shin

Page 1 of 1

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the Claims

Claim 1, Column 8, Line 54:

Delete “unit” and insert --unit if--, therefor (2nd Occurrence)

Claim 19, Column 10, Line 53:

Delete “an” and insert --an engagement--, therefor

Signed and Sealed this
Fifteenth Day of September, 2015



Michelle K. Lee
Director of the United States Patent and Trademark Office